

TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

PERSONAL PROTECTIVE EQUIPMENT FOR DOSE REDUCTION DURING SPECIAL NUCLEAR MATERIAL (SNM) HANDLING

Identification No.: RL-01-012-NM

Date: September 2000

Program: Nuclear Materials Stabilization

OPS Office/Site: Richland Operations Office/Hanford Site

PBS No.: RL-CP03

Waste Stream: N/A

TSD Title: N/A

Operable Unit (if applicable): N/A

Waste Management Unit (if applicable): N/A

Facility: Plutonium Finishing Plant (PFP)

Priority Rating:

This entry addresses the “Accelerated Cleanup: Paths to Closure (ACPC)” Priority:

- ☐ 1. Critical to the success of the ACPC
- ☐ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
- ☒ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

Need Title: Personal Protective Equipment for Dose Reduction during Special Nuclear Material (SNM) Handling.

Need/Opportunity Category: *Technology Opportunity*

Need Description:

- Description: During the stabilization process activities at the PFP, SNM is handled in storage containers while being transferred to/from vaults and NDA instruments, and within gloveboxes in process equipment and vessels. The dose incurred by operations staff is significant, and can result in constraints on schedule as yearly or other periodic dose limits are approached.
- Background: The baseline for dose control is the ALARA approach, using current personnel protective equipment (PPE) such as leaded gloves and vests, and incorporating process and

storage equipment shielding. While this approach is well documented as resulting in dose reduction, there is room for improvement and innovation in the way PPE is used. Some of the PPE used for dose reduction is cumbersome, difficult to use, and reduces dexterity, as well as often being quite heavy. Light-weight, easy to wear and use PPE is sought to improve productivity and user comfort, as well as potentially providing additional dose reduction.

- Improved PPE would be applicable to many operations at the PFP and potentially at other facilities on the Hanford Site and other DOE Sites as well as military and commercial applications.

Schedule Requirements: A specific need date is not defined. Most dose to PFP operations personnel will be incurred through the 2000-2005 period.

Earliest Date Required: 10/2000

Latest Date Required: N/A

Problem Description: During handling of SNM materials at the PFP, radiation dose, primarily gamma and neutron, is incurred during transfers to and from storage, while performing NDA measurements, and in operating process equipment and moving containers inside gloveboxes. Much of the handling is done manually due to the design of the facility and systems, and the flexible operational sequences, and automation to remove the operator handling is impractical. Specialized PPE is used where possible to minimize radiation dose, including leaded gloves in gloveboxes and leaded vests for use while handling SNM items. However, there are limitations in the effectiveness of this PPE, in terms of weight and comfort in use. The potential for lighter, more user friendly PPE that can result in dose reduction needs to be pursued.

Material science progress has been rapid through the past several decades, and it is likely that composite materials that can perform better in both dose reduction and comfort in the user environment exist. These materials need to be identified and integrated into PPE that can be delivered to the facilities for a reasonable cost.

Potential Life-Cycle Cost Savings of Need (in \$000s) and Cost Savings Explanation: A specific cost savings is not proposed for this technology, as the full impact is difficult to judge, and cost of innovative PPE is not known. However, the impact of a significant improvement in dose reduction could potentially be very large if it helps avoid schedule delays due to running up against the yearly dose limits. The cost of a single month of additional plant operations is on the order of several million dollars, and the only alternative if the yearly dose limits are limiting may be increasing the operational crews, with the attendant additional costs for training and inefficiencies in using the added manpower in specific processes.

Benefit to the Project Baseline of Filling Need: A significant benefit can accrue if significant dose reduction is achieved. Currently, one of the constraints on the project schedule is the number of operational staff that approach the yearly dose limit before the end of the year, and

prevent full utilization of personnel to continue process operations. This can lengthen schedules or require hiring and training of more staff at considerable expense.

Relevant PBS Milestone: TRP-14-401, Complete PFP Deactivation, 9/30/16

Functional Performance Requirements: The improved PPE needs to be light weight and flexible to assure user comfort. Breathable fabrics or components contribute to the ability to wear the PPE for extended periods and in high heat conditions. Dose reduction gains can be measured by comparing the new materials to those in current use, and by using the ALARA analyses that have been completed for most of the PFP processes.

Work Breakdown Structure (WBS) No.: **TIP No.:**

1.04.05.01.13

N/A

Justification For Need:

Technical: Dose reduction is a primary goal of the mandated ALARA policy, and also provides incentive due to more efficient use of personnel and potential for both cost savings and schedule gains.

Regulatory: Federal law limits worker exposure to 5 Rem per year, and the DOE Orders and contractors administrative requirements further reduce the allowable exposure levels.

Environmental Safety & Health: Depending on the type of PPE and application, it may need to meet standards for clothing flammability, eye protection, and hand protection. Waste stream regulations for eventual disposal must be considered.

Cultural/Stakeholder Concerns: None.

Other: N/A

Current Baseline Technology: N/A

End-User: Fluor Hanford, Inc., Nuclear Materials Stabilization Project

Contractor Facility/Project Manager: George W. Jackson, Director, Nuclear Materials Stabilization Project, Fluor Hanford, Inc. (509) 373-6622

Site Technical Points-of-Contact: M. W. Gibson, Fluor Hanford, Inc. (FH), (509) 373-4869, Fax (509) 372-0232, email mark_w_Gibson@rl.gov

DOE End-User/Representative Point-of-Contact: F. M. Roddy, DOE-RL Material Disposition Division (509) 372-0945, Fax (509) 376-0695, francis_m_roddy@rl.gov